A traffic light is placed at the corner of College and Main, and when we arrive at the intersection the probability of the light being green is 35%. If P(green) = 0.35, what is the probability the light is not green?

Compliment of probability

$P(\sim green) = P(green^c) = 1 - 0.35 = 0.65$

If the probability of the light being yellow is P(yellow) = 0.04, what is the probability of the light being red (assuming P(green) = 0.35)?

$$P(\text{green} \cup \text{yellow}) = P(\text{green}) + P(\text{yellow})$$
$$= 0.35 + 0.04$$
$$= 0.39$$

$$P(\sim(\text{green} \cup \text{yellow})) = 1 - 0.39$$
$$= 0.61$$

Assuming probabilities of P(green) = 0.34, P(yellow) = 0.04, and P(red) = 0.61, calculate the following:

a) What is the probability you find the light red both Monday and Tuesday?

$P(\text{red Monday} \cap \text{red Tuesday}) = P(\text{red}) \cdot P(\text{red})$
$= (0.61)(0.61)$
$= 0.37$

b) What is the probability you don't hit a red light until Wednesday?

$P(\text{G/Y Monday} \cap \text{G/Y Tuesday} \cap \text{R Wednesday}) =$
$= (.39)(.39)(.61)$
$= 0.93$

c) What is the probability that you will have to stop at least once during the week?

"At least once" means stopping 1, 2, 3, 4, or 5 times during the week.

We want the case where you don't stop at all.

"At least" means the compliment (NOT what they are asking for).

$P(\text{no red lights}) = (.39)(.39)(.39)(.39)(.39)$
$= 0.009$

$P(\text{having to stop at least once}) = 1 - P(\text{no red lights})$
$= 1 - 0.009$
$= 0.991$

A certain bowler can bowl a strike 70% of the time. What is the probability that she:

a) goes three consecutive frames without a strike?

b) makes her first strike in the third frame?

c) has at least one strike in the first three frames?

d) bowls a perfect game (12 consecutive strikes)?

$P(\sim strike) = 1 - 0.70 = 0.30$

a) $P(1 \sim strike \cap 2 \sim strike \cap 3 \sim strike)$

$= (0.3)(0.3)(0.3)$

$= 0.027$

b) $P(1 \sim strike \cap 2 \sim strike \cap 3\ strike)$

$= (0.3)(0.3)(0.7)$

$= 0.063$

c) $P(\text{at least 1 strike in 1st 3 frames})$

$= 1 - P(\text{no strikes})$

$= 1 - 0.027$ (from answer to a)

$= 0.973$

d) $P(12\ strikes) = (0.70)^{12}$

$= 0.014$

Probability Rules (ch. 15):

- General Addition Rule:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

 - This works for sets of two events, whether or not they are disjoint.

- Conditional Probability:
 - Notation: $P(B \mid A)$

 "the probability of B given A"

 - Equation: $P(B \mid A) = \dfrac{P(A \cap B)}{P(A)}$

 - $P(B \mid A)$ and $P(A \mid B)$ are NOT always equal! They can be but do not have to be.

- Independence:
  - Events A and B are independent when

    $P(B \mid A) = P(B)$.

  - Disjoint events cannot be independent.
- Events:
  - Two events could either be independent or disjoint, but not both.
  - Two events could neither disjoint nor independent.